## Worksheet 6 PageRank Answers

### Activity 1:

PageRank is a method of presenting search results in order of relevance. The formula for PageRank is:

$$PR(A) = (1-d) + d\ (PR(T_i)/C(T_i) + \ldots + PR(T_n)/C(T_n))$$

- **PR(A)** is the PageRank of page A
- **PR(Ti)** is the PageRank of pages **Ti** which link to page **A**
- **d** is the damping factor
- **C(Ti)** is the number of outbound links on page **Ti**

The more we iterate the formula, the more accurate the PageRank. Assume that the initial PageRank for each web page is 1.

1. Using the PageRank algorithm, calculate the PageRank for the web pages listed in the following scenarios. You must show your working to **five iterations.** Rank the web pages in order of relevance based on your findings.
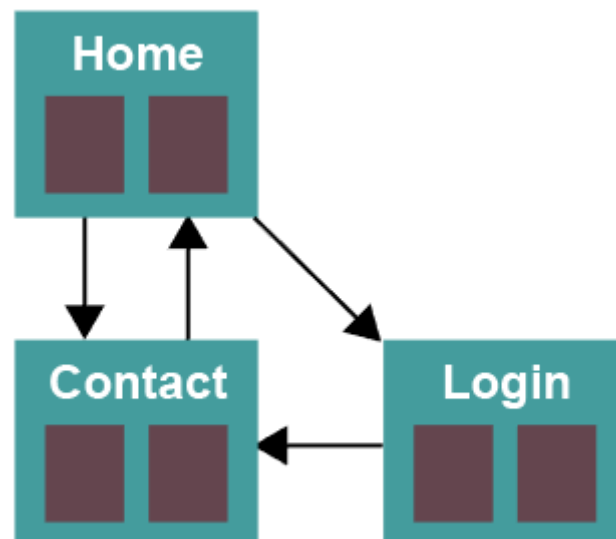


- The Home Page links to the Contact Us page and Login page
- The Contact Us page links to the home page
- The Login page links to the Contact Us page

1st iteration
P(Home page) = .15 + .85(1/1) = 1
P(Contact Us page) = .15 + .85(1/2)+(1/1) = 1.58
P(Login page) = .15 + .85(1/2) = 0.58

2nd iteration
P(Home page) = .15 + .85(1.58/1) = 1.49
P(Contact Us page) = .15 + .85(1.49/2)+(0.58/1) = 1.36
P(Login page) = .15 + .85(1.49/2) = 0.78

3rd iteration
P(Home page) = .15 + .85(1.36/1) = 1.30
P(Contact Us page) = .15 + .85(1.30/2)+(0.78/1) = 1.48
P(Login page) = .15 + .85(1.30/2) = 0.70

4th iteration
P(Home page) = .15 + .85(1.48/1) = 1.40
P(Contact Us page) = .15 + .85(1.40/2)+(0.70/1) = 1.44
P(Login page) = .15 + .85(1.40/2) = 0.75

5th iteration
P(Home page) = .15 + .85(1.44/1) = 1.37
P(Contact Us page) = .15 + .85(1.37/2)+(0.75/1) = 1.48
P(Login page) = .15 + .85(1.37/2) = 0.73

Ranked in order of relevance according to PageRank:
1. Contact us page
2. Home page
3. Login page

2. Using the PageRank algorithm, calculate the PageRank for the web pages listed in the following photography website. Show your working to **five iterations.** Rank the web pages in order of relevance based on your findings.
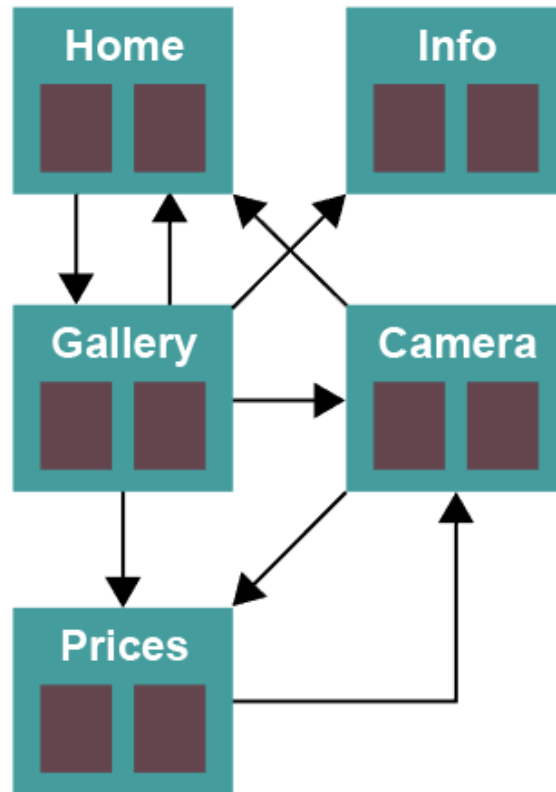


- The Home page links to the Gallery page
- The Gallery page links to the Home, Information, Prices and Camera pages
- The Prices page links to the Camera page
- The Information page has no outbound links
- The Camera page links to the Home page and the Prices page

1st iteration
P(Home page) = .15 + .85(1/4)+(1/2) = 0.86
P(Gallery page) = .15 + .85(0.86/1) = 0.88
P(Prices) = .15 + .85(0.88/4) + (1/2) = 0.83
P(Information) = .15 + .85(0.88/4) = 0.33
P(Camera) = .15 + .85 (0.88/4) + (0.83/1) = 1.16

2nd iteration
P(Home page) = .15 + .85(0.88/4)+(1.16/2) = 0.91
P(Gallery page) = .15 + .85(0.91/1) = 0.92
P(Prices) = .15 + .85(0.92/4) + (1.16/2) = 0.93

P(Information) = .15 + .85(0.92/4) = 0.35
P(Camera) = .15 + .85 (0.92/4) + (0.93/1) = 1.28

3rd iteration
P(Home page) = .15 + .85(0.92/4)+(1.28/2) = 0.99
P(Gallery page) = .15 + .85(0.99/1) = 0.99
P(Prices) = .15 + .85(0.99/4) + (1.28/2) = 1
P(Information) = .15 + .85(0.99/4) = 0.36
P(Camera) = .15 + .85 (0.99/4) + (1/1) = 1.36

4th iteration
P(Home page) = .15 + .85(0.99/4)+(1.36/2) = 1.04
P(Gallery page) = .15 + .85(1.04/1) = 1.03
P(Prices) = .15 + .85(1.03/4) + (1.36/2) = 1.04
P(Information) = .15 + .85(1.03/4) = 0.37
P(Camera) = .15 + .85 (1.03/4) + (1.04/1) = 1.4

5th iteration
P(Home page) = .15 + .85(1.03/4)+(1.4/2) = 1.06
P(Gallery page) = .15 + .85(1.06/1) = 1.05
P(Prices) = .15 + .85(1.05/4) + (1.4/2) = 1.07
P(Information) = .15 + .85(1.05/4) = 0.37
P(Camera) = .15 + .85 (1.05/4) + (1.07/1) = 1.44

Ranked in order of relevance:
1. Camera
2. Prices
3. Home page
4. Gallery page
5. Information